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C. Charoenwong

David K. DING

Singapore Management University, davidding@smu.edu.sg

Y. C. Yang

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Charlie Charoenwong
Division of Banking and Finance
Nanyang Business School
Nanyang Technological University
Singapore 639798, Singapore

David K. Ding**
School of Economics and Finance
College of Business
Massey University
Auckland, New Zealand
and
Lee Kong Chian School of Business
Singapore Management University
Singapore 178899

Yung Chiang Yang
Queen's University Belfast
Belfast, Northern Ireland
United Kingdom

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**All comments are welcome. Please address correspondence to: David K. Ding, School of Economics and Finance, College of Business, Massey University, Auckland, New Zealand, Tel: (64) 9 414 0800 ext 9465, Fax: (64) 9 441 8177, e-mail: d.ding@massey.ac.nz.

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ABSTRACT

This article presents a discussion of stock market liquidity and its relation to financial crises. It begins by defining liquidity and explaining possible measures of liquidity and then explores factors influencing liquidity. It also analyzes the liquidity among 11 Asian countries. The empirical findings based on the time-series analysis show a sharp decline in stock liquidity during both the 1997–1998 Asian and the recent 2007–2008 global financial crisis. The multivariate regression results show that both stock liquidity and trading activity decrease after large market declines. Stock liquidity responds significantly to large market declines in South Korea and Taiwan whereas it is least sensitive in Singapore. The findings indicate that stock trading, measured by turnover, slows down after a large market decline, which affects trading activity in all markets examined especially those of South Korea and China, but have the least effect in Singapore and Japan.

KEYWORDS: Asian markets, emerging markets, financial crisis, liquidity, trading activity.

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1. INTRODUCTION

No agreement exists on a single definition of liquidity. Kyle (1985, p. 1316) notes that "Liquidity is a slippery and elusive concept, in part because it encompasses a number of transactional properties of markets. These include tightness, depth, and resiliency." In the market microstructure literature, O'Hara (1994) offers a widely-accepted definition of liquidity as the ability to trade immediately without cost. In effect, the greater the degree of immediacy, the greater is the market's liquidity.

Transaction costs impose frictions on the market and reduce liquidity. Collins and Fabozzi (1991) view transaction costs as the market impact of the trade execution cost that reflects the bid-ask spread plus a price concession for compensating the market maker for the risk of transacting with an informed trader. They also point out that market timing costs occur when prices react to other trading activities during a transaction. Increasing trading in the market provides more liquidity to the market. As a result, economies of scale in trading can lower both the bid-ask spread and the average transaction cost.

Locke and Venkatesh (1997) document an average quoted bid-ask spread that is higher than the average cost per transaction. Clark (1973), Epps and Epps (1976), and Harris (1986) show the price volatility in each transaction is monotonically and positively related to the transaction volume. Bessembinder and Seguin (1993) further show a strong positive relationship between contemporaneous volume and volatility. The impact of unanticipated volume is two to 13 times greater than the impact on the volatility of an expected volume. Ragunathan and Peker (1997), who extend Bessembinder and Seguin's study, find an even deeper relationship between

price volatility and intraday volume. Their findings support those of prior studies that volatility is more likely to be influenced by lagged volatility.

Similar to these prior studies, Jones, Kaul, and Lipson (1994) find a positive volatility-volume relationship. Their results show that average trade size has little impact on the volatility-volume relationship, while the influence from the number of trades is much greater. Brailsford (1996) concludes that daily volume has a positive relationship with daily price changes in the Australian stock market and suggests using the number of shares traded to measure trading activity. Easley and O'Hara (1992) and Harris and Raviv (1993) report the number of transactions is positively related to price changes.

Various studies examine the intricacies of financial markets. For example, Cornell (1981) documents a consistent positive relationship between the average daily volume and price variability among liquid contracts in futures markets. Using generalized autoregressive conditional heteroskedasticity (GARCH) and generalized method of moments (GMM) techniques to study the relationship between volume and volatility in crude oil futures, Foster (1995) finds that illiquidity may drive securities prices from their fair value and promote a large trade in response to an obvious mispricing. A sudden increase in trading volume is thought to lead to an increase in price volatility. Working (1953) views a successful futures market as one that offers a high quality hedge with sufficient liquidity. The existence of cross hedging, where a less than perfect hedge is substituted for a more liquid contract, shows a preference for liquidity over the quality of the hedge (Black, 1986). Such behaviors have led to withdrawing illiquid contracts in the futures market. This is in line with the observations by Silber (1981), Black (1986), and Duffie and Jackson (1989) that exchanges tend to maximize liquidity to maximize their revenue when greater transaction volume exists.

The remainder of paper is organized as follows. The next section provides an overview of market liquidity among 11 selected markets in Asia and how it might be measured. This is followed by a discussion on the evidence stemming from financial crises in general and then looking at how financial crises can affect a particular measure of liquidity (Amihud price-impact) and trading activity (determined by a turnover measure). The resultant findings from the empirical study are reported in this paper, where several conclusions are drawn by comparing the results across the 11 stock markets.

2. DATA AND LIQUIDITY MEASURES

This study uses stock market and accounting data from Thomson Reuter's Datastream Advance database during the period 1990–2009. Balance sheet and market data are used to compute the liquidity and turnover measures. The sample contains 1,361,236 firm-year observations from 11 Asian countries. Amihud's (2002) price-impact and turnover liquidity measures are adopted. Of the 11 countries and economies included in the sample, three – Japan, Hong Kong, and Singapore – are considered developed, while the remaining ones are treated as developing economies.

Table 1 provides a summary of the data characteristics of the 11 economies. There are 11,210 unique firms from the 1,361,236 firm-year observations over the period 1990 to 2009. Japan is the largest market in terms of the number of public firms: it has more than 3,000 unique firms included in the sample of study. Mainland China, Hong Kong, and India are also large markets with more than 1,000 unique firms in the sample. South Korea, Malaysia, Singapore, Thailand, and Taiwan are important markets in Asia, with each country having more than 500

unique firms during the period of study. Finally, Indonesia and Philippines are the two smallest markets in this study with fewer than 400 unique firms.

(Insert Table 1 about here)

Market capitalization is measured in terms of U.S. dollars (USD). Japan has the largest firms with an average market capitalization of each firm exceeding $1 billion. The average firm size in China, Hong Kong, Taiwan, India, and Korea is around $500 million, while the average firm size in the remaining markets is much smaller. Both Japan and Korea have high stock prices with an average stock price of about $50, while the average stock price in the other markets is considerably lower than this value. The average leverage ratio (debt-to-asset) across all sample countries or economies is 25 percent, whereas the average book-to-market equity ratio over all stocks across all markets is 1.11.

Liquidity is often measured with direct or indirect trading cost. A direct trading cost is the bid-ask spread while an indirect trading cost includes the price-impact measure. However, bid-ask spreads and intraday data are unavailable for long periods, especially for emerging markets. Therefore, researchers use low frequency bid-ask spread proxies such as the Roll (1984) measure for the effective bid-ask spread or other liquidity measures inferred from stock prices and trading volume.

Various studies investigate the effectiveness of commonly used proxies. For example, Goyenko, Holden, and Trzcinka (2009) compare many popular low frequency bid-ask spread and price-impact proxies with their high frequency counterparts. They find the low frequency "effective tick" developed by Holden (2009) is the best proxy for the bid-ask spread; and the

lower frequency Amihud (2002) measure is the best measure for price-impact. By definition, the *effective tick* is the weighted average tick size that is effectively used to arrive at an effective spread (Holden, 2009).

The Amihud (2002) price impact measure is based on the notion of liquidity similar to that introduced by Kyle (1985). It measures the ability of an investor to trade in a stock without affecting its price. This measure has the intuitive interpretation of being an estimate of the price impact, which is consistent with the notion of the extent to which price pressure associated with buying and selling reflects a stock's liquidity is reflected (Grossman and Miller, 1988).

A *liquid market* is one in which investors can trade with a minimal effect on price. Computing the monthly Amihud illiquidity measure is as follows:

$$AMIHUD_{i,t} = \log\left(1 + \frac{1}{N}\sum_{k=1}^{N}\frac{|R_{i,k}|}{P_{i,k}VO_{i,k}}\right) \quad (1)$$

where $R_{i,k}$ is the daily stock return; $P_{i,t}$ is the stock price; and $VO_{i,k}$ is the trading volume for stock i on day k. The monthly Amihud illiquidity measure is constructed from the daily Amihud measure by taking the mean value of the daily Amihud value in a given month. The analysis uses the natural logarithm of the Amihud value. To avoid taking the logarithm of zero in the case of no returns, an arbitrary constant of one is added to this measure before computing its logarithmic value. The daily stock returns and stock prices are measured in domestic currency terms as shown in the summary statistics of Table 2 and, later, in the respective country-level regressions as shown in Table 3. The Amihud measures are stated in dollar terms when the cross-country data are pooled into a single regression.

Some studies use monthly turnover as a trading activity measure. For example, Lo and Wang (2000) contend that turnover is a natural measure of trading activity. Liquidity is positively related to trading activity as investors can change their stock positions instantly. The

authors define turnover as the number of shares traded in a given month divided by the total number of shares outstanding. Lo and Wang further show that turnover is non-stationary. Therefore, the study presented in this article measures turnover in logarithmic terms and de-trends the monthly turnover series with the prevailing 12-month moving averages to account for non-stationarity. Griffin, Nardari, and Stulz (2007) and Karolyi, Lee, and Dijk (2012) also use this approach. The turnover measure used in the multivariate analysis for stock i on month t is computed as follows:

$$TURNOVER_{i,t} = \log\left(1 + \frac{VO_{i,t}}{NOSH_{i,t}}\right) - \frac{1}{12}\sum_{k=1}^{12} \log\left(1 + \frac{VO_{i,t-k}}{NOSH_{i,t-k}}\right) \quad (2)$$

where $VO_{i,t}$ and $NOSH_{i,t}$ are the trading volume and number of shares outstanding of stock i in month t, respectively.

3. STOCK LIQUIDITY IN ASIAN MARKETS

This section provides summary statistics of monthly illiquidity and trading activity of 11 Asian markets. The analysis of the characteristics of firms from these markets highlights several stylized facts. One such fact is that a cross-country variation occurs with the Amihud measure. Because this measure uses a local currency unit, cross-country comparisons are made with illiquidity measured in U.S. dollar terms. The descriptive statistics of stock liquidity and turnover presented in Table 2 show that China and Taiwan enjoy the highest stock liquidity (i.e., the lowest Amihud measure), while the Philippines and Indonesia are the least liquid markets during the sample period. The rankings of these countries and economies during the sample period, from the most liquid to the least liquid, are: China, Taiwan, South Korea, Japan, Hong Kong, Singapore, Malaysia, India, Thailand, Philippines, and Indonesia. This ranking is similar to those reported in other liquidity studies including Lesmond (2005), Bekaert, Harvey, and Lundblad

(2007), and Lee (2011). While some evidence shows that stock liquidity is positively related to capital market development measured by total market capitalization as a fraction of GDP (not reported), the Chinese market is clearly an outlier. China has low total market capitalization compared to its gross domestic product (GDP), and yet their stocks enjoy high liquidity. This observation is probably due to China's rapid stock market development during the early 2000s.

(Insert Table 2 about here)

Another stylized fact is the Amihud measure is highly skewed. The average company's Amihud measure is greater than the median measure in all countries. The natural logarithm of the illiquidity measure in the regression analyses is employed to remove the presence of substantial skewness. From the turnover summary statistics reported in Table 2, the countries with the highest average turnover are South Korea, Philippines, and China. On average, the monthly trading volume for a firm's stock in these countries is more than 30 percent of the shares outstanding. By comparison, the least active markets are Hong Kong, Japan, and Singapore. The ranking here differs from the stock liquidity ranking. Again, the turnover measure is also skewed, whereas the mean turnover is much lower than the median turnover in all countries. For all firms in the sample, the mean monthly turnover is 17 percent of the stock outstanding, while the median is much lower at 3 percent of the stock outstanding.

Lesmond (2005) studies the cross-country determinants of stock liquidity. He uses the measures developed by Lesmond, Ogden, and Trzcinka (1999) and Amihud (2002) to study the liquidity in 31 emerging markets for the period from 1987 to 2000. His finding is that countries with weak political and legal institutions have significantly higher liquidity costs than do

countries with strong political and legal systems. Another strand of the cross-country liquidity research focuses on the liquidity effect of stock returns (Bekaert et al., 2007; Lee, 2011).

Figure 1 presents charts of the time-series illiquidity behavior for all 11 Asian markets from 1990 to 2009. The Amihud measure of liquidity displays large variation over time and has experienced a sharp spike during 1997 and 2007 in many countries. These two periods coincide with the Asian and global financial crises. The Asian financial crisis started in Thailand in July 1997 and then spread to other countries including Malaysia, Indonesia, and South Korea. The illiquidity shock during the 1997–1998 period of financial crisis is easily observed in the charts for these countries, as well as those for Singapore and Hong Kong. However, the 1997 shock is less obvious when looking at Japan, China, and Taiwan. Liquidity began to improve after the financial crisis of 1997–1998 as greater capital inflows stabilized the markets.

(Insert Figure 1 about here)

From 2000 to 2005, some stocks markets experience illiquidity spikes or remain liquid after the Asian financial crisis. Japan, Hong Kong, Singapore, and Indonesia experience some illiquidity shocks during this period. All countries except China and India in the sample experience another round of liquidity shocks in either 2007 or 2008. These periods coincide with the global liquidity crunch originating from the United States in 2007, which then spread to Europe in 2008 before affecting the Asian equity markets.

Figure 2 presents charts of the time-series stock turnover behavior for all 11 Asian markets from 1990 to 2009. The stock turnover shows less obvious movements during a financial crisis, although a sharp reduction in turnover should have occurred because of a

reduction in investor inflows. One possible reason is that stock turnover fluctuates within a smaller range; therefore observing it visually from the trend diagram is difficult. In the multivariate analysis, the reduction of the turnover during a financial crisis period is statistically significant.

(Insert Figure 2 about here)

4. FINANCIAL CRISIS

Næs, Skjeltorp, and Ødegaard (2011) report changes in liquidity in the U.S. stock market coincide with changes in the real economy. They document that stock market liquidity contains leading information about the real economy. Using detailed market ownership data from Norway, the authors further show not only that investors' portfolio compositions change with the business cycle but also that investor participation is related to market liquidity. This evidence suggests that systematic liquidity variation is related to the presence of "flight to quality" or "flight to liquidity" during an economic downturn.

While the study by Næs et al. (2011) provides evidence of portfolio composition changes over the business cycle, including during periods of crises that can lead to changes in market liquidity within a single market, macroeconomic fundamentals such as real GDP growth as alluded to by the authors may not totally explain the spread of a crisis from one market to another. Summers (2000) points out that market illiquidity may have worsened the international contagion. For example, when some highly leveraged institutions experienced substantial losses after a crisis in one market, margin calls and a lack of liquidity may have led these institutions to reduce their positions in other markets, thus feeding the contagion. In a related study, Boyer, Kumangai, and Yuan (2006) classify stocks in emerging markets into two types: stocks that are

foreigner accessible and those that are foreigner inaccessible. They show the returns of accessible stocks lead those that are inaccessible during a crisis period. The authors further provide evidence of crises spreading through the asset holdings of international investors rather than through changes in macroeconomic fundamentals. In contrast, portfolio rebalancing could act as a channel for a crisis to spread to developed markets. Forbes and Rigobon (2002) also report evidence that international trade linkages allow country-specific crises to spread to stock markets elsewhere in the world. Kaminsky, Lyons, and Schmukler (2001) show the Mexican, Asian, and Russian crises triggered withdrawals by mutual funds from other countries.

Brunnermeier and Pedersen (2009) provide an alternative explanation of liquidity that is based on the interaction between stock market liquidity and funds available at financial intermediaries. Their model suggests that funding constraints, and hence firm-specific liquidity's co-movement with market liquidity and market returns, will be particularly pronounced when the available capital that is necessary for providing liquidity is limited during a market downturn. Empirically, Hameed, Kang, and Viswanathan (2010) provide evidence that liquidity decreases and co-movement increases during market downturns. This is consistent with a reduction in liquidity supply when the market declines.

In summary, large market downturns cause market liquidity, and thus stock liquidity, to decline because capital becomes scarcer and overall uncertainty is high. Vayanos (2004) suggests that liquidity providers become more risk averse in the face of uncertainty about asset values. Investors rebalance their portfolio in view of the uncertainty of capital constraint. This causes a systematic "flight-to-liquidity" effect. If such investors hold large portfolios across multiple markets, their portfolio rebalancing activities would spread the effect of the funding constraint from one market to another, causing a downturn in other stock markets as well.

5. RELATIONSHIP BETWEEN FINANCIAL CRISIS AND STOCK LIQUIDITY

After visually inspecting the time-series charts on stock illiquidity (Figure 1), multivariate regression analysis is used to study the effects of a financial crisis on stock liquidity. The analysis focuses on illiquidity and trading activity measures on a crisis indicator variable while controlling for many other variables. Separate regressions for each country, as well as a pooled regression that includes all countries, are performed.

The transformed domestic currency AMIHUD measure from Equation 24.1 is used as the first dependent variable in the regression analysis. This study uses the definition of the variable CRISIS from Hameed et al.'s (2010) study. Therefore, this variable takes on a value of one if the market return in the previous month has declined by more than 1.5 standard deviations compared to their past 10 years' average monthly return. This definition captures the notion that liquidity providers are more likely to be financially constrained when their own capital has decreased because of a market downturn and that borrowing from funding sources due to increased uncertainty is more difficult. From the descriptive statistics presented in Table 1, 4.34 percent of the sample months is classified as a crisis month according to the above definition.

A firm's underlying strength may also affect the liquidity of its stock. Five firm-level characteristics are employed in the analyses as control variables. Following Stoll (2000), firm size, measured by the logarithm of market capitalization in millions of dollars (MV), the logarithm of stock price (PRICE), and return volatility measured by the logarithm of the standard deviation of monthly returns over one-year periods (RETVOL) are included. The rationale for using these variables is based on inventory and order processing costs. Firm size controls for the cost of inventory and locating a trade counterparty; and stock price controls for the discreteness

effect while acting as a proxy for risk, as lower priced stocks tend to be riskier. Ho and Stoll (1981) show the stock return variation is relevant to liquidity because the supplier of immediacy is not diversified with respect to an unwanted position. Other control variables included are book-to-market ratio (BM) and leverage (LEVERAGE), which are considered proxies of firm risk. Firm-level characteristics are obtained from the Datastream and Worldscope data bases. Further, firm and year fixed effects are included in all regressions to control for the firm-invariant effect and the year effect. Specifically, the coefficients of the following model are estimated.

$$AMIHUD_{i,t} = \alpha_0 + \beta_1 CRISIS_{t-1} + \beta_2 MV_{i.t-1} + \beta_3 BM_{i,t-1} + \beta_4 PRICEi_{,t-1} + \beta_5 LEVERAGE_{i,t-1} + \beta_6 RETVOL_{i,t-1} + Fixed\ Effects \quad (3)$$

Panel A of Table 3 displays the regression results of a financial crisis on stock illiquidity. The coefficient of the CRISIS variable is positive and significant at the 0.01 level in all countries except for the Philippines. The top three countries where the coefficient of CRISIS is most significant are Japan, India, and China. For these countries, the onslaught of a financial crisis most significantly contributes to a decline in their stock market's liquidity. Because the variable AMIHUD is a measure of illiquidity rather than liquidity, the results imply the market liquidity of stocks in these countries have declined significantly during a period of crisis. The impact of the crisis is not uniform across all countries. Some countries experienced a larger decline in stock liquidity than others. The AMIHUD measure carries a currency unit where a simple comparison of CRISIS coefficients across different countries is not feasible. Therefore, for each country, the coefficient of CRISIS is compared against the overall mean value of AMIHUD. On average, stock market liquidity declines by 27 percent of the mean AMIHUD value during a period of crisis. The largest decline is observed in South Korea where liquidity fell by more than 100

percent of the mean AMIHUD value, Taiwan by 43 percent, while Singapore experienced the smallest decline of 4 percent. The last column of Table 3 presents the pooled sample results of the USD-denominated AMIHUD measure as the dependent variable, where the coefficient of CRISIS is positive and the test statistic is greatly improved by the increase in sample size.

(Insert Table 3 about here)

Panel B of Table 3 shows the regression results of a financial crisis on trading activity. The dependent variable is TURNOVER, which is the log-transformed and de-trended monthly stock turnover. The coefficients of CRISIS are negative and significant for all countries except for Singapore and the Philippines. Trading activity measured by stock turnover declines during a financial crisis. A comparison of the coefficients across countries finds the crisis has a more negative impact on South Korea and China, but a lesser negative impact on Japan and Singapore. Stock market segmentation and the relevant legal environment can possibly explain the cross-country variation of the impact of a financial crisis on stock market liquidity and turnover. However, this study does not empirically examine the possible explanations for cross-country differences.

The decline in both liquidity and trading activity in a stock market during a crisis period is worthy of discussion. Using intraday data from the United States, Chordia, Roll, and Subrahmanyam (2001) find a negative relationship between stock liquidity and trading liquidity. However, they study the general relationship between stock liquidity and trading activity. The results from Table 3 focus on the relationship between stock liquidity and trading activity conditioned on a large market decline, and the general relationship may change during such a

period. Lesmond (2005) finds that trading cost in emerging markets increases sharply during the Asian and Russian financial crises, but that results from stock turnover show little movement during these crises. Similarly, Yeyati, Horen, and Schmukler (2008) find that trading volume remains stable during the early period of a crisis but declines later, suggesting a decrease of activity after portfolio reallocation is completed. Their study uses monthly turnover as a measure of trading activity. It captures the broader effect of a crisis on trading activity but not the short-term dynamics of trading activity as in the case of Chordia et al.

A recent study by Lang and Maffett (2011) explores the firm level information environment and the effects of stock liquidity during large market downturns. They document that stocks with higher transparency are less sensitive to liquidity shocks in general and particularly to increases in liquidity variability and co-variability that accompany crisis periods. Therefore, firm level transparency matters more when overall investor uncertainty is greater.

In summary, the results reported in this article support common intuition and findings of prior studies that both stock liquidity and trading activity decline during crisis periods. The reported findings are consistent with those of Boyer et al. (2006), Bekaert et al. (2007), Yeyati et al. (2008), Hameed et al. (2010), and Næs et al. (2011). In general, these studies conclude the presence of a financial crisis can explain the significant decreases in stock market liquidity (measured by proxies such as market depth, resiliency or trading immediacy) and trading activity (measured by volume, turnover or number of shares traded).

6. SUMMARY AND CONCLUSIONS

Using the Amihud (2002) illiquidity measure, a time trend and cross-country variation of stock market liquidity among 11 Asian markets are reported for the period from 1990 to 2009. China,

Taiwan, South Korea, Japan, Hong Kong, and Singapore are the most liquid markets during this period whereas Malaysia, India, Thailand, Philippines, and Indonesia are the least liquid over the same time period. A sharp decline in stock market liquidity has occurred during the Asian financial crisis period of 1997–1998 and the global credit crunch of 2007–2008.

The multivariate empirical results show that stock market liquidity decreases after large market declines. Stock market liquidity is most responsive to a large market decline in South Korea and Taiwan while stock liquidity in Singapore is least sensitive to a market downturn. The findings further indicate that stock trading, measured by turnover, slows down after large market declines. The large market declines affect trading activity in all markets, especially in South Korea and China but have the least effect on trading activity in Singapore and Japan.

The findings reported in this study provide evidence on stock liquidity and trading activity that are systematically related to stock market crises. Previous studies such as Vayanos (2004) and Næs et al. 2011 suggest the decline of liquidity during a crisis period is due to portfolio rebalancing. Portfolio rebalancing can be triggered by a portfolio's funding constraint, a change of risk of individual stocks in view of an impending crisis or a change of risk aversion in view of uncertainty. The result is that capital will see a "flight to liquidity" during a financial crisis. Further evidence from prior studies shows crises spreading from one market to another through the asset holdings of international investors (Boyer et al., 2006; Forbes and Rigobon, 2002). At first glance, the portfolio rebalancing explanation is inconsistent with the findings of this study as portfolio rebalancing during a financial crisis that increases trading activity is contrary to the results of this paper. However, portfolio rebalancing probably only occurs in selected stocks and the process is completed in a short period. Therefore, the monthly trading activity measure used in this study does not capture any short-term stock turnover spikes.

Following from the findings of this study, several possible avenues emerge for related future research on liquidity and trading activity during a financial crisis. An area worthy of further investigation is the cross-sectional variation of stock liquidity and trading activity during a crisis. Some stocks may be more prone to stock market declines, while others may be less affected by a crisis. Another topic left for future examination is exploring cross-country explanations on the impact of a crisis on stock liquidity and trading activity.

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Table 1 Sample Composition and Firm Characteristics

This table presents the number of firms (NFirms) and the mean of various firm characteristics for 11 Asian countries included in the analysis. The CRISIS column presents the percentage of the monthly sample that is defined as a crisis period. A month is defined as having a crisis if the monthly stock market declines by more than 1.5 standard deviations of its past 10 years' monthly return. The means of the market capitalization measured in millions of dollars (domestic currency and USD), stock price (domestic and USD), leverage (LEVERAGE), book-to-market equity ratio (BM), and stock return volatility (RETVOL) are reported. LEVERAGE is the ratio of total debt divided by total assets. RETVOL is the natural logarithm of the standard deviation of monthly stock returns over the preceding 12 months. The sample period is from January 1990 to December 2009.

Country			**Market Cap (Mean)**		**Price (Mean)**				
	NFirms	**CRISIS %**	**Domestic**	**USD**	**Domestic**	**USD**	**LEVERAGE**	**BM**	**RETVOL**
China (CN)	1,547	4.04	4,305	564	7.16	0.93	0.2721	0.4181	−2.1152
Hong Kong (HK)	1,056	4.40	4,373	563	8.35	1.09	0.1715	1.3484	−1.9092
Indonesia (ID)	380	3.43	2,033,666	273	1,353.43	0.27	0.2850	1.4148	−1.9331
India (IN)	1,185	4.90	19,621	449	142.84	3.28	0.2777	1.1146	−1.8757
Japan (JP)	3,116	5.33	128,649	1,131	5,926.45	52.38	0.2462	1.1346	−2.3381
South Korea (KR)	851	2.01	430,942	415	44,749.42	47.55	0.2944	1.9389	−1.9323
Malaysia (MY)	864	3.01	797	239	2.09	0.65	0.2235	1.2832	−2.2051
Philippines (PH)	200	2.66	10,858	274	29.70	0.76	0.1904	2.0866	−1.9299
Singapore (SG)	646	6.21	602	384	1.16	0.74	0.1893	1.4243	−2.1544
Thailand (TH)	559	4.38	7,485	226	27.82	0.91	0.2772	1.2229	−2.1526
Taiwan (TW)	806	2.61	18,686	591	26.66	0.84	0.2286	0.9516	−2.0963
ALL	11,210	4.34		695		23.94	0.2452	1.1080	−2.1517

Table 2 Descriptive Statistics for Stock Illiquidity and Trading Activity

This table presents the time series means, median, and standard deviations of the Amihud illiquidity measure and the stock turnover for 11 Asian countries. The monthly Amihud measure is constructed from the daily Amihud measure by taking the mean value of the daily Amihud value in a given month. The daily Amihud measure is an absolute value of daily stock return divided by trading value. The stock return and trading volume value can be measured in either domestic currency or U.S. dollar terms. Stock turnover is defined as the number of shares traded during a given month divided by the total number of shares outstanding. The sample period is from January 1990 to December 2009.

Country	**Amihud (Domestic)**			**Amihud (USD)**			**Turnover**		
	Mean	**Median**	**Standard Deviation**	**Mean**	**Median**	**Standard Deviation**	**Mean**	**Median**	**Standard Deviation**
China (CN)	0.0047	0.0018	0.0106	0.0350	0.0147	0.0656	0.3050	0.1692	0.3682
Hong Kong (HK)	2.1472	0.0619	7.7857	16.9430	0.4936	61.4405	0.0568	0.0170	0.1231
Indonesia (ID)	0.0399	0.0009	0.1415	385.1158	8.4974	1,368.8774	0.1183	0.0097	0.3832
India (IN)	1.8161	0.0165	22.1504	73.2138	0.7153	937.4994	0.2191	0.0252	1.7003
Japan (JP)	0.0084	0.0010	0.0221	1.0507	0.1215	2.6847	0.0609	0.0185	0.1701
South Korea (KR)	0.0008	0.0001	0.0036	0.9700	0.0786	4.1727	0.5812	0.1403	1.2924
Malaysia (MY)	7.1577	0.3373	29.3903	25.9524	1.2906	103.9749	0.0680	0.0135	0.1800
Philippines (PH)	2.2464	0.1441	7.0390	108.2429	8.0817	338.3416	0.4816	0.0049	3.2158
Singapore (SG)	14.1105	0.4576	50.6146	22.9040	0.8226	80.9566	0.0636	0.0157	0.1382
Thailand (TH)	2.4995	0.0358	9.6561	94.7645	1.4845	365.1119	0.2355	0.0273	0.7861
Taiwan (TW)	0.0203	0.0007	0.1119	0.6800	0.0226	3.6620	0.2656	0.1235	0.3876
ALL	1.6674	0.0026	15.5095	27.1406	0.1376	357.8563	0.1726	0.0304	0.7771

Table 3 Multivariate Analysis of the Financial Crisis on Stock Illiquidity and Trading Activity

This table reports the results from firm-level OLS regressions of a financial crisis on stock illiquidity or trading activity. The dependent variables are stock illiquidity measured by the monthly AMIHUD (Panel A) and trading activity measured by TURNOVER (Panel B). The monthly AMIHUD measure is constructed from the daily Amihud measure by taking the mean value of the daily Amihud value in a given month. The daily Amihud measure is an absolute value of the daily stock return divided by the value of trading volume. Stock turnover is defined as the number of shares traded during a given month divided by the total number of shares outstanding. The first 11 columns of each report the regression estimates by country with firm and year fixed effects. The last column reports the regression estimates of the pooled sample with firm and year fixed effects. CRISIS is an indicator variable that takes on the value of one if the monthly stock market declines by more than 1.5 standard deviations of the past 10 years' monthly return. MV is the natural logarithm of the market capitalization of a firm in millions of the domestic currency. BM is the book-to-market equity ratio. PRICE is the natural logarithm of the stock price in domestic currency terms. LEVERAGE is the ratio of total debt divided by total assets. RETVOL is the natural logarithm of the standard deviation of monthly stock returns over the preceding 12 months. NObs is the number of observations. Fixed effects coefficients are not tabulated. Robust t-statistics are in parentheses. The sample period is from January 1990 to December 2009.

Panel A. Relationship of the financial crisis on stock illiquidity (AMIHUD)

	JP	HK	SG	CN	IN	ID	KR	MY	PH	TW	TH	ALL
CRISIS	0.001	0.057	0.051	0.001	0.036	0.010	0.001	0.061	0.021	0.007	0.095	0.083
	(15.10)	(6.26)	(3.20)	(8.68)	(8.80)	(3.02)	(7.67)	(4.12)	(0.81)	(3.32)	(6.00)	(20.12)
MV	−0.004	−0.333	−0.584	0.000	−0.190	−0.012	−0.001	−0.381	−0.075	0.028	−0.287	−0.376
	(−4.42)	(−24.34)	(−11.94)	(0.20)	(−7.16)	(−4.38)	(−8.73)	(−12.55)	(−2.51)	(2.61)	(−11.08)	(−29.66)
BM	0.002	−0.007	0.008	0.002	0.060	−0.001	0.000	0.048	0.000	−0.011	0.048	0.000
	(6.61)	(−1.25)	(0.58)	(2.06)	(4.74)	(−1.27)	(1.28)	(3.60)	(0.91)	(−2.97)	(3.58)	(0.85)
PRICE	−0.003	−0.021	−0.350	−0.003	−0.023	−0.011	0.000	−0.201	−0.199	−0.061	0.021	−0.140
	(−3.98)	(−1.99)	(−6.79)	(−2.60)	(−0.85)	(−3.68)	(1.84)	(−6.06)	(−5.29)	(−4.68)	(0.90)	(−11.11)
LEVERAGE	0.011	0.036	0.206	−0.001	0.040	−0.003	−0.000	0.082	0.068	0.011	0.175	0.153
	(6.88)	(0.73)	(1.45)	(−1.87)	(0.45)	(−0.31)	(−0.12)	(1.10)	(0.66)	(0.79)	(2.12)	(4.50)
RETVOL	−0.001	−0.044	−0.151	−0.001	−0.037	0.000	−0.000	−0.118	−0.003	0.002	−0.007	−0.095
	(−5.84)	(−5.25)	(−7.53)	(−6.22)	(−3.29)	(0.04)	(−6.79)	(−8.05)	(−0.18)	(0.97)	(−0.49)	(−17.54)
Intercept	0.058	2.218	2.692	0.018	1.734	0.216	0.008	2.333	1.175	−0.032	2.081	4.259
	(15.01)	(23.46)	(9.56)	(2.81)	(11.49)	(9.08)	(10.18)	(15.03)	(5.98)	(−0.59)	(13.85)	(53.29)
Fixed Effects	F,Y	F,Y	F,Y	F,Y	F,Y	F,Y	F,Y	F,Y	F,Y	F,Y	F,Y	F,Y
NObs	505,470	109,495	62,264	153,328	93,985	38,159	109,455	107,031	22,459	95,527	64,112	1,361,236
Adjusted R^2	0.46	0.47	0.59	0.56	0.55	0.24	0.23	0.54	0.36	0.50	0.41	0.67

Table 3 Multivariate Analysis of the Financial Crisis on Stock Illiquidity and Trading Activity (Continued)

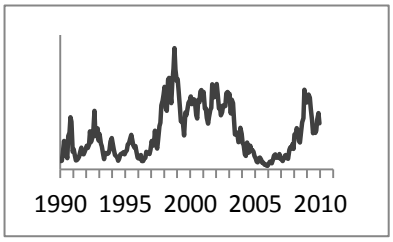
Panel B. Relationship of financial crisis on trading activity (TURNOVER)

	JP	HK	SG	CN	IN	ID	KR	MY	PH	TW	TH	ALL
CRISIS	−0.001	−0.004	−0.001	−0.036	−0.024	−0.022	−0.054	−0.007	0.008	−0.027	−0.017	−0.013
	(−2.16)	(−3.15)	(−0.79)	(−18.80)	(−14.02)	(−4.49)	(−9.92)	(−3.66)	(1.49)	(−12.86)	(−3.90)	(−21.77)
MV	−0.011	−0.010	−0.007	−0.025	−0.011	−0.010	−0.028	−0.003	−0.010	−0.034	−0.027	−0.017
	(−5.34)	(−6.37)	(−3.24)	(−3.31)	(−1.39)	(−2.27)	(−7.86)	(−0.96)	(−2.39)	(−6.05)	(−2.54)	(−15.39)
BM	−0.002	−0.000	0.003	−0.006	−0.001	0.001	−0.003	−0.000	0.000	−0.002	−0.004	0.000
	(−5.50)	(−0.04)	(2.89)	(−1.86)	(−1.05)	(1.02)	(−3.07)	(−0.33)	(0.23)	(−1.01)	(−1.30)	(0.13)
PRICE	0.004	0.003	0.003	−0.039	−0.004	0.000	0.005	−0.001	0.008	0.029	0.009	0.003
	(2.12)	(2.37)	(1.14)	(−5.06)	(−0.51)	(0.09)	(2.59)	(−0.26)	(1.43)	(5.32)	(1.07)	(2.93)
LEVERAGE	0.005	0.003	0.016	0.038	0.018	0.016	−0.006	0.003	−0.014	−0.026	−0.000	0.015
	(1.84)	(0.50)	(2.21)	(5.08)	(1.22)	(1.84)	(−0.48)	(0.50)	(−1.32)	(−3.04)	(−0.00)	(5.51)
RETVOL	−0.003	−0.001	−0.003	−0.019	0.017	−0.001	0.008	−0.004	0.002	0.011	−0.015	0.002
	(−7.01)	(−0.91)	(−1.59)	(−8.13)	(3.80)	(−0.27)	(1.79)	(−2.34)	(0.90)	(5.22)	(−1.36)	(2.81)
Intercept	0.066	0.048	−0.008	0.126	0.139	0.083	0.247	−0.022	0.070	0.263	−0.011	0.105
	(6.84)	(4.90)	(−0.62)	(2.67)	(3.45)	(1.81)	(7.82)	(−1.35)	(2.48)	(6.84)	(−0.16)	(13.21)
Fixed Effects	F,Y	F,Y	F,Y	F,Y	F,Y	F,Y	F,Y	F,Y	F,Y	F,Y	F,Y	F,Y
NObs	504,752	109,545	62,209	153,328	93,469	38,191	109,656	107,030	22,462	95,505	64,132	1,360,279
Adjusted R^2	0.05	0.07	0.08	0.13	0.08	0.03	0.03	0.06	0.02	0.03	0.09	0.04

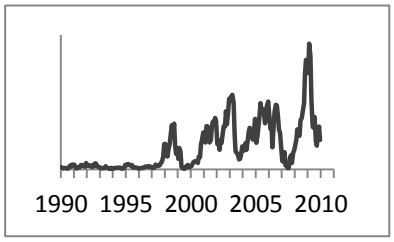
Figure 1 Time-Series Variation in Amihud Illiquidity Measure for Asian Countries

This figure plots the average Amihud illiquidity measure in 11 Asian countries in each month during the sample period from January 1990 to December 2009. The monthly Amihud illiquidity measure is computed from the daily Amihud measure by taking the mean value of daily Amihud value in a given month. The daily Amihud measure is an absolute value of daily stock returns divided by trading volume value. The charts below show the time-series trend of the equally weighted average of the Amihud measure across individual stocks in each country or economy.

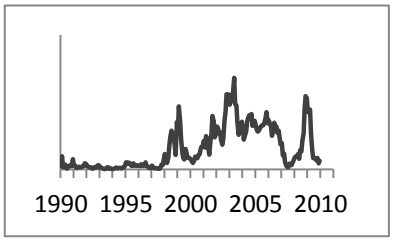
Japan



Singapore



Hong Kong



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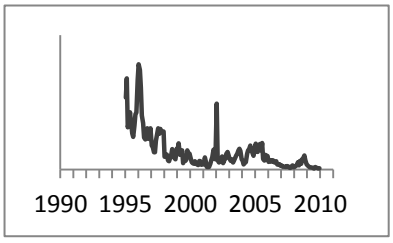

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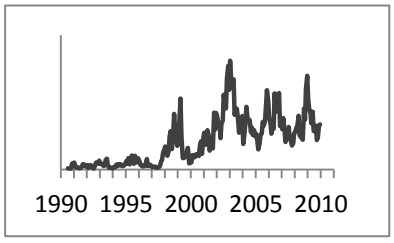

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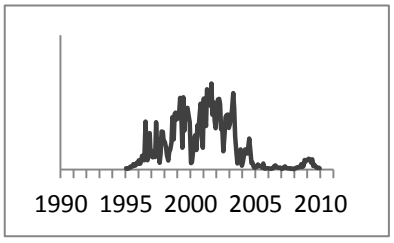

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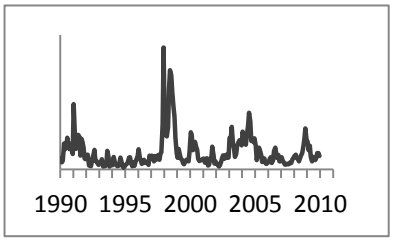
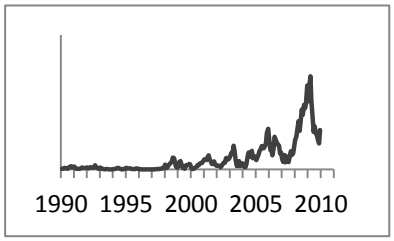


Malaysia



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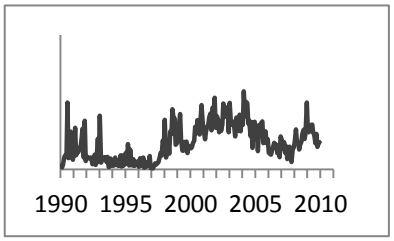

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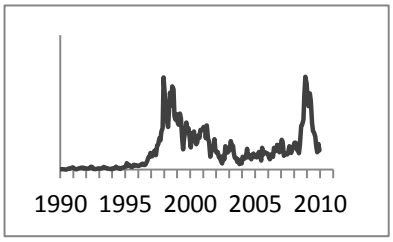

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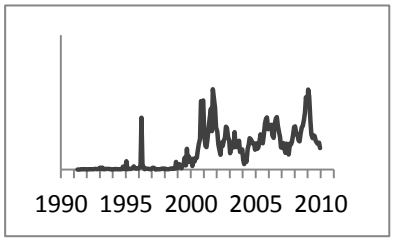
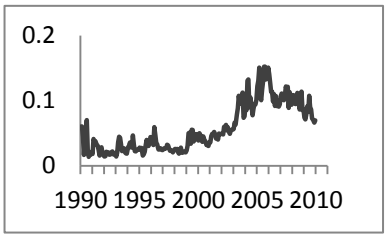


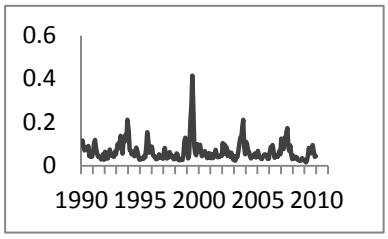
Figure 2 Time-Series Variation in Stock Turnover for Asian Countries

This figure plots the average stock turnover in 11 Asian countries in each month during the sample period from January 1990 to December 2009. Stock turnover is defined as the number of shares traded during a given month divided by the total number of shares outstanding. The charts below show the time-series trend of the equally weighted average of the stock turnover across individual stocks in each country or economy.

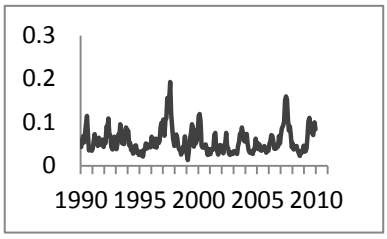
Japan



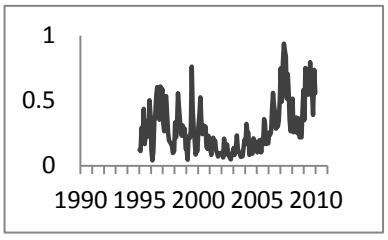
Singapore



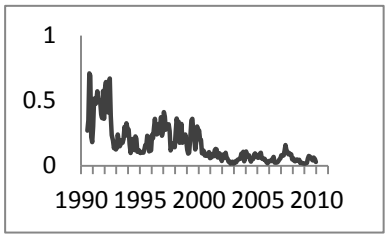
Hong Kong



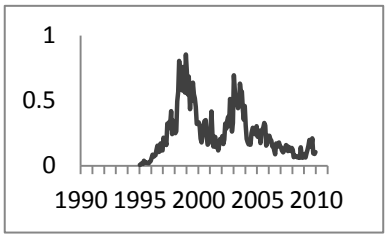
China



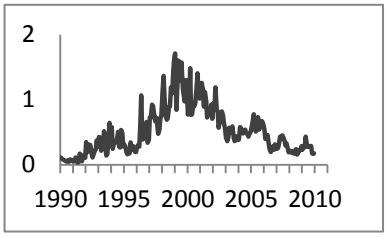
Indonesia



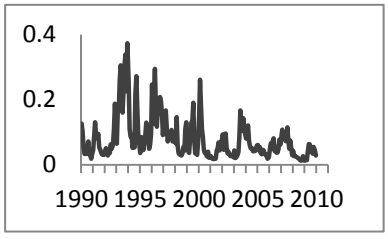
India



South Korea



Malaysia



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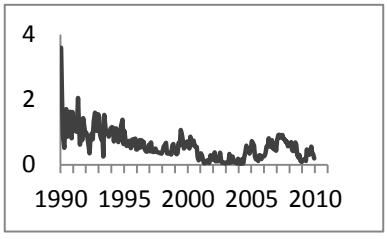

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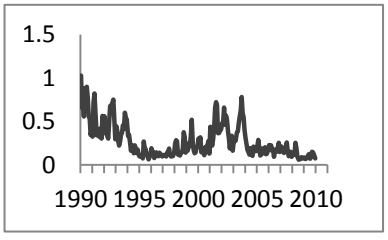

Taiwan